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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/897,426	07/03/2001	Masaaki Nanaumi	107348-00127	8333

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EXAMINER	
CREPEAU, JONATHAN	
ART UNIT	PAPER NUMBER
1746	10

DATE MAILED: 09/04/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

AS-10

Office Action Summary	Application No.	Applicant(s)	
	09/897,426	NANAUMI ET AL.	
	Examiner	Art Unit	
	Jonathan S. Crepeau	1746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 July 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *5-8* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *5-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *8,9* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Response to Amendment

1. This Office action addresses newly added claims 5-8. The claims are rejected under 35 USC §103 for substantially the reasons of record. Accordingly, this action is made final.

Claim Rejections - 35 USC § 103

2. Claims 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 99/29763 (Soczka-Guth et al) in view of Cavalca et al (U.S. Pre-Grant Publication No. 2001/0033960), in view of Grot (U.S. Patent 5,547,911).

U.S. Patent 6,355,149, also to Soczka-Guth et al., is taken as an English-language equivalent of WO 99/29763. Regarding claim 5, in column 2 line 49, the '149 patent teaches a membrane electrode assembly for a fuel cell. Regarding claims 5 and 8, the membrane comprises sulfonated aromatic polyether ether ketone ("sPEEK") (see col. 1, line 50). Regarding claim 6, the sPEEK does not contain fluorine (see col. 1, lines 53-63) and is inherently soluble in a solvent. Regarding claim 5, the ion exchange capacity (Ic) of the membrane is 1.35-1.95 meq/g (see col. 12, lines 56-67). The modulus of elasticity (i.e., dynamic viscoelastic modulus) of the membrane in the dry state at 23°C is greater than or equal to 1300 N/mm^2 (1.3×10^9 Pa) (see col. 2, lines 37-45). Thus, the dynamic viscoelastic modulus at 85°C would inherently be at least 5×10^8 Pa, as recited in claim 5.

Soczka-Guth et al. do not expressly teach that each electrode contains a polymer ion-exchange component or that the weight ratio of the component to the catalyst in the electrodes is in the range of 0.05 to 0.80, as recited in claim 5, or that the component comprises a polymer with a different solubility than the polymer comprising the membrane (claims 6 and 7).

The Cavalca et al. publication is directed to membrane electrode assemblies. In paragraph 124, the reference teaches that the electrodes contain an ionically conductive polymer that "can be substantially the same or different" than the polymer of the membrane.

The patent of Grot et al. is directed to methods imprinting catalytically active particles on a membrane. In column 5, line 66 et seq., the reference teaches a fuel cell comprising an electrode containing an ion-exchange polymer, wherein the ratio of ion exchange polymer to carbon-supported catalyst is 1:3 (0.33).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated by the disclosure of Cavalca et al. to incorporate a polymer ion-exchange component into the electrodes of Soczka-Guth et al. In paragraph 124, Cavalca et al. teach that "[i]n addition to supported metal catalyst, the electrode should further comprise ionically conductive polymer to improve the contact of the electrode to the membrane and increase catalyst utilization." Thus, the artisan would be motivated to incorporate a polymer ion-exchange component (i.e., sPEEK) into the electrodes of Soczka-Guth et al.

Further, the artisan would be motivated to use a polymer component in the electrodes of Soczka-Guth et al. having a different solubility than that used in the membrane, as recited in claims 6 and 7. In paragraph 124, Cavalca et al. teach that the two polymers "preferably are

substantially the same. Substantially the same means that the two ionically conductive materials, for example, (i) can be selected to have different equivalent weights although having the same general chemical identity, (ii) can be used with different contents of fillers or additives; or (iii) can have the same general polymer backbone but different ionic groups." Cavalca et al. further teach in paragraph 125 that the electrode preferably contains a hydrophobic compound to improve water repellency. These teachings would motivate the artisan to modify the composition, in particular the equivalent weight, of the sPEEK contained in the electrodes of Soczka-Guth et al. In column 2, line 59, Soczka-Guth et al. state that equivalent weight is the reciprocal of ion exchange capacity, and that ion exchange capacity refers to the ratio of sulfonated units to the total number of repeating units. Therefore, the artisan would be motivated to adjust the equivalent weight of the polymer in the electrodes of Soczka-Guth et al., to make the polymer more hydrophobic, as suggested by Cavalca et al. The artisan would be able to accomplish this by decreasing the proportion of sulfonated monomer units in the polymer. Accordingly, the polymer contained in the electrodes, being more hydrophobic, would inherently have a higher solubility in a nonpolar solvent than the polymer of the membrane. Thus, the subject matter of claim 7 would be rendered obvious.

Furthermore, the artisan would be motivated by the disclosure of Grot et al. to use a polymer-to-catalyst ratio of 0.33 in the electrodes of Soczka-Guth et al. In column 5, line 67, Grot et al. teach that this ratio is "preferred" for fuel cell electrodes. Accordingly, this would provide the artisan sufficient motivation to use a polymer-to-catalyst ratio of 0.33 in the electrodes of Soczka-Guth et al.

Additionally, as noted above, Soczka-Guth et al. disclose the ion-exchange capacity and dynamic viscoelastic modulus values of the electrolyte membrane. However, regarding the limitations in claim 5 that the ion-exchange capacity and dynamic viscoelastic modulus are in relation to the entire electrolyte membrane/electrode assembly, the artisan would expect the values of the modified electrolyte membrane/electrode assembly of Soczka-Guth et al. to be nearly identical to those values disclosed for the membrane electrolyte. This is because, as noted above, the artisan would be motivated by Cavalca to incorporate a polymer almost compositionally identical to the polymer of the electrolyte into the electrodes of Soczka-Guth et al. Therefore, the artisan would ascertain that the values of the ion-exchange capacity and dynamic viscoelastic modulus of the entire membrane electrode assembly would be substantially the same of those of the membrane. Accordingly, these recitations in claim 5 are not considered to distinguish over the references.

Furthermore, regarding the limitations in claim 6 that the second (i.e., electrode) polymer component is soluble when immersed in a first solvent and that the first (i.e., membrane) polymer component is subsequently soluble when immersed in a second solvent, these limitations are also met by the references because as noted above, the second polymer has a higher solubility in the first solvent than the first polymer. Furthermore, the recitation of "when said electrolyte membrane/electrode assembly is immersed..." represents the future intended use of the membrane electrode assembly, and as such, the modified membrane assembly of Soczka-Guth et al. is capable of being used in the specified manner. See, e.g., *In re Schreiber*, 128 F.3d 1473, 1477, 44 USPQ2d 1429, 1431 (Fed. Cir. 1997).

Response to Arguments

3. Applicant's arguments filed July 7, 2003 have been fully considered but they are not persuasive. Applicants assert that, regarding the Soczka-Guth reference, "the ion-exchange capacity Ic and dynamic viscoelastic modulus Dv at 85°C defined in claim 5 are values related to the electrolyte membrane electrode assembly and not to any polymer ion-exchange component constituting the assembly." While this assertion has merit, it is the Examiner's position that the Soczka-Guth reference, when combined with the Cavalca reference, fairly suggests the claimed subject matter. As stated above, the artisan would be motivated by Cavalca to incorporate a polymer almost compositionally identical to the polymer of the membrane electrolyte into the electrodes of Soczka-Guth et al. Therefore, the artisan would be able to reasonably ascertain that the values of the ion-exchange capacity and dynamic viscoelastic modulus of the entire modified membrane electrode assembly Soczka-Guth would be nearly identical to those of the electrolyte membrane by itself. Accordingly, these recitations are still not considered to distinguish the claims over the references.

Conclusion

4. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

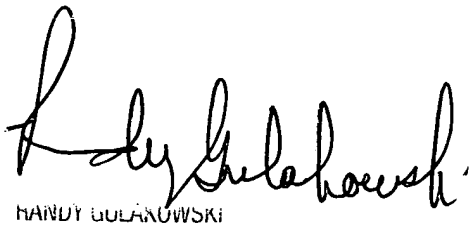
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Crepeau whose telephone number is (703) 305-0051. The examiner can normally be reached Monday-Friday from 9:30 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski, can be reached at (703) 308-4333. The phone number for the organization where this application or proceeding is assigned is (703) 305-5900. Additionally, documents may be faxed to (703) 872-9310 (for non-final communications) or (703) 872-9311 (for after-final communications).

Any inquiry of general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

JSC

August 29, 2003



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